

Pending Claims:

1. (Previously presented) A biomaterial composition comprising:
a bioresorbable biomaterial compound comprising calcium, oxygen and phosphorous,
wherein a portion of at least one of said elements is substituted with an element
having an ionic radius of approximately 0.1 to 0.6Å; and
a pharmaceutical agent.
- 2 - 37. (Cancelled)
38. (Withdrawn) The use of the biomaterial compound as claimed in claim 1 as a
coating of thickness 0.1 to 10 microns on implantable prostheses.
39. (Withdrawn) The use of the biomaterial compound as claimed in claim 1 in tissue
engineering.
40. (Withdrawn) The use of the biomaterial compound as claimed in claim 1 as a
carrier for pharmaceutical agents.
41. (Withdrawn) The use of the biomaterial compound as claimed in claim 40,
wherein said compound acts as a slow release vehicle for pharmaceuticals at desired sites of
implantation.
42. (Withdrawn) The use of the biomaterial compound as claimed in claim 41
wherein said pharmaceutical is a bone growth factor.
43. (Withdrawn) A method for substituting natural bone at sites of skeletal surgery in
human and animal hosts with a biomaterial compound comprising calcium, oxygen and

phosphorous wherein at least one of said elements is substituted with an element having an ionic radius of approximately 0.1 to 1.1 Å;

said method comprising the steps of:

implanting said biomaterial compound at the site of skeletal surgery wherein such implantation promotes the formation of new bone tissue at the interfaces between said biomaterial compound and said host, the progressive removal of said biomaterial compound primarily through osteoclast activity, and the replacement of that portion of said biomaterial compound removed by further formation of new bone tissue by osteoblast activity, such progressive removal and replacement being inherent in the natural bone remodeling process.

44. (Withdrawn) A method for repairing large segmental skeletal gaps and non-union fractures arising from trauma or surgery in human and animal hosts using a biomaterial compound comprising calcium, oxygen and phosphorous wherein at least one of said elements is substituted with an element having an ionic radius of approximately 0.1 to 1.1 Å;

said method comprising the steps of:

implanting said biomaterial compound at the site of the segmental skeletal gap or non-union fracture wherein such implantation promotes the formation of new bone tissue at the interfaces between said biomaterial compound and said host, the progressive removal of said biomaterial compound primarily through osteoclast activity, and the replacement of that portion of said biomaterial compound removed by further formation of new bone tissue by osteoblast activity, such progressive removal and replacement being inherent in the natural bone remodeling process.

45. (Withdrawn) A method for aiding the attachment of implantable prostheses to skeletal sites and for maintaining the long term stability of said prostheses in human and animal hosts using a biomaterial compound comprising calcium, oxygen and phosphorous wherein at least one of said elements is substituted with an element having an ionic radius of approximately 0.1 to 1.1 Å;

said method comprising the steps of:

coating selected regions of an implantable prosthesis with said biomaterial compound, implanting said coated prosthesis into a skeletal site wherein such implantation promotes the formation of new bone tissue at the interfaces between said biomaterial compound and said host, the generation of a secure interfacial bond between said host bone and said coating, the subsequent progressive removal of said coating primarily through osteoclast activity such that the coating is diminished, and the replacement of that portion of said biomaterial compound removed by further formation of new bone tissue to generate a secure interfacial bond directly between said host bone and said prosthesis.

46. (Withdrawn) A method for providing tissue-engineering scaffold for bone replacement in human or animal hosts using a biomaterial compound comprising calcium, oxygen and phosphorous wherein at least one of said elements is substituted with an element having an ionic radius of approximately 0.1 to 1.1 Å;

said method comprising the steps of:

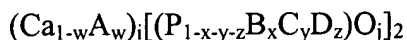
forming said biomaterial compound as a macroporous structure comprising an open cell construction with interconnected voids, combining mature and/or precursor bone cells with said macroporous structure, and allowing the cells to infiltrate said structure in order to develop new mineralized matrix throughout said structure.

47. (Withdrawn) A method for delivering pharmaceutical agents to the site of skeletal surgery in human or animal hosts using a biomaterial compound comprising calcium, oxygen and phosphorous wherein at least one of said elements is substituted with an element having an ionic radius of approximately 0.1 to 1.1 Å;

said method comprising the steps of:

combining a pharmaceutical agent with said biomaterial compound and applying the pharmaceutical agent combined with said biomaterial compound to a site of skeletal surgery, wherein such application results in controlled local release of said pharmaceutical agent.

48. (Withdrawn) The method of claim 43 wherein said biomaterial compound has the formula;



wherein A is selected from those elements having an ionic radius of approximately 0.4 to 1.1 Å;

B, C and D are selected from those elements having an ionic radius of approximately 0.1 to 0.4 Å;

w is greater than or equal to zero but less than 1;

x is greater than or equal to zero but less than 1;

y is greater than or equal to zero but less than 1;

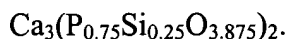
z is greater than or equal to zero but less than 1;

x + y + z is greater than zero but less than 1;

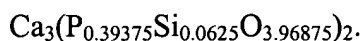
i is greater than or equal to 2 but less than or equal to 4; and

j equals 4-δ where δ is greater than or equal to zero but less than or equal to 1.

49. (Withdrawn) The method of claim 43 wherein said biomaterial compound has the formula:



50. (Withdrawn) The method of claim 43 wherein said biomaterial compound has the formula:



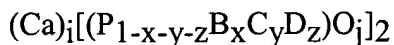
51. (Withdrawn) The method of claim 43 wherein said biomaterial compound is combined with at least one calcium phosphate material selected from the group consisting of calcium hydroxyapatite, α-TCP, β-TCP, octocalcium phosphate, tetracalcium phosphate, dicalcium phosphate and calcium oxide.

52. (Withdrawn) The method of claim 43, wherein said biomaterial compound additionally comprises an additive to increase the mechanical toughness and strength of said compound.

53. (Previously presented) The composition as claimed in Claim 1, wherein said biomaterial composition acts as a slow release vehicle for said pharmaceutical agent.

54. (Previously presented) The composition as claimed in Claim 53, wherein said pharmaceutical agent is a bone growth factor.

55. (Previously presented) The composition of Claim 1, wherein said biomaterial compound has the formula:



wherein B, C and D are selected from those elements having an ionic radius of approximately 0.1 to 0.4Å;

x is greater than or equal to zero but less than 1;

y is greater than or equal to zero but less than 1;

z is greater than or equal to zero but less than 1;

x + y + z is greater than zero but less than 1; and

i is greater than or equal to 2 but less than or equal to 4; and

j is equal to 4-δ where δ is greater than or equal to zero but less than or equal to 1.

56. (Previously presented) The composition as claimed in Claim 55, wherein B is silicon.

57. (Previously presented) The composition as claimed in Claim 55, wherein B is boron.